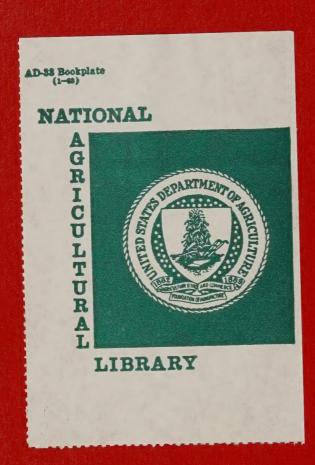
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FINAL REPORT TO USDA-SEA
ON COOPERATIVE AGREEMENT
No. 12-14-5001-279

JUL 071980

CATALOGING = PREP.

December 21, 1979

Cooperator, Richard G. Clarke, Department of Entomology, Oregon State University Covallis, Oregon 97331

Introduction:

This cooperative agreement was developed in April 1977 between the Oregon Agricultural Experiment Station and the USDA-SEA to have the Cooperator collect efficacy and phytotoxicity data on insecticides used against selected insect pests of ornamental crops which at that time lacked effective means of control, i.e., a specific nationally registered insecticide. A list of 4 pests on 5 ornamental crop species was developed and several candidate insecticides were chosen for evaluation (see pg 2 of agreement). This report does not parallel directly the original proposal. Over the $2\frac{1}{2}$ year period of this agreement both registration needs and priorities have changed. Also, adequate pest populations necessary to show efficacy were lacking in some cases. But, professional judgement I hope ruled and the usefulness of the enclosed efficacy data, particularly the pitch moth trials, will assist the registration process or end the pursuit of registration for materials that really show no promise. In the case where materials such as acephate have been registered during the course of this agreement we can be thankful that the public interest has been served even though this particular agreement did not directly lead to that registration.

Results. - Tests Completed

In the attached appendices (7) are the "IR-4 National Pesticide Registration Program" forms for 7 efficacy test conducted during the agreement period:

Appendix 1 - 1977 - Acephate - Golden Chain Leafminer

Appendix 2 - 1977- Phosmet - Adult Root Weevils

Appendix 3 - 1977- Phosmet - Adult Root Weevils

Appendix 4 - 1978- Chlorpyrifos - Sequoia Pitch Moth

Appendix 5 - 1978- Phosmet - Sequoia Pitch Moth

Appendix 6 - 1978- Chlorpyrifos - Sequoia Pitch Moth

Appendix 7 - 1979- " " "

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Cooperative Agreement No. 12-14-5001-279 Final Report December 21, 1979 Page 2.

Appendices 2,3,4,5, and 6 have been previously submitted in appropriate quarterly reports during the past $2\frac{1}{2}$ years. They are again included for the sake of completeness.

Tests Not Conducted. The work originally proposed for adult root weevils with acephate was completed in cooperation with Chevron Chemical Company and about 1 year ago acephate (Orthene®) was granted a national label which included adult root weevils on rhododendron and azalea.

Orthene was also tested and proved effective in other work, supported by other sources, and the data is currently being used by Chevron Chemical Company to get a 24C, local needs registration for Oregon and Washington, for acephate for root weevil larval control when applied as a drench treatment to container-grown nursery stock. I chose not to test chlorpyrifos or azinphosmethyl as originally proposed because of their higher human hazard as compared to acephate which has now proven effective.

One holly leafminer test was conducted in 1978 but not results were obtained. However, during this agreement period, Chevron acquired sufficient data elsewhere apparently to include it on their national label. Therefore, further work in 1979 was not needed. As I said, needs changed over the course of this work.

My report then, will deal with acephate against the golden chain leafminer, phosmet against adult root weevils, and phosmet and chlorpyrifos against the sequoia pitch moth.

Summary of Results and Conclusions:

Golden chain leafminer. A single test (Appendix 1) was conducted in 1977. No fly population developed and therefore no data was collected. Acephate was not phytotoxic on golden chain. This is not a widely grown tree and nurseries which grow sufficient numbers where testing could be conducted did not have problems. Isolated homeowners over the years have reported problems but it was not practical to set up tests on 1 or 2 trees in scattered locations.

Cooperative Agreement No. 12-14-5001-279 Final Report December 21, 1979 Page 3.

Adult Root Weevils.— The results of Phosmet on adult root weevils are reported in Appendices 2 and 3. The results were not significant because of the low feeding damage at the 2 test sites. It was my impression, however, that Phosmet is not as good as acephate (Orthene which is now registered for adult root weevil control. At these same locations we applied acephate also in other tests and even though the untreated plants had low feeding levels, acephate clearly was superior to Phosmet probably due to its local systemic effects giving a longer protection period.

My conclusion would be that Phosmet <u>does</u> <u>not</u> show sufficient promise to pursue registration for this particular useage.

Sequoia Pitch Moth. This turned out to be a very difficult insect to work with because of its long life cycle (1-2 yrs) and the difficulty in assessing control (evaluations of efficacy).

We ran tests for 3 years at the same locations: SunRiver and Medford Oregon. The plots at SunRiver, Oregon were dropped in 1979 because of the decreased insect population level. The results in 1978 from SunRiver are reported in Appendix 4. We initially tested both Phosmet and Chlorpyrifos but Phosmet did not show any promise after 1977 and 1978 test years. Therefore, in 1979 it was dropped in favor of intensifing our efforts using chlorpyrifos which showed marginal promise at the Medford Plots (Appendix 6).

Only in 1979 (Appendix 7), did we show any control of this insect by the chemical used. Chlorpyrifos did reduce the numbers of larvae dug from pitch masses of treated trees as compared to the untreated trees.

My conclusion would be that Phosmet should <u>not</u> be evaluated further as it apparently has little control potential. Chlorpyrifos definitely <u>should</u> be considered for registration particularly if supportive data is available from other scientists at other locations.

At least 2 applications are necessary under Oregon conditions. The accumulative effect of yearly applications maybe the key to control of this insect. Protection for at least a 2 month period is necessary because of the long adult flight period.

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IR-4—NATIONAL PESTICIDE REGISTRATION PROGRAM

. APPENDIX 1

MINOR USE EFFICACY REPORT FORM—1

Summary of results: Use reverse side

PR NO: 1900A

Date of Report: Dec 20, 1979

Year Research Conducted: 1977 (For performance and phytotoxicity data) Control of the Golden Chain Leafminer Project Title: __ Investigator (name, address, phone): __Richard G. Clarke, Department of Entomology, Oregon State University, Corvallis, OR 97331 (503) 754-4392 Commodity/Site: Golden Chain (Laburnum) Golden Chain Leafminer (Leucoptera laburnella) Pest(s): _____ Pesticide: Acephate _____ EPA Reg. No.. __ _____ Rates (a.i.): ____1.5, 0.75, 0.37 lb ai/100ga Formulation ______75 S Manufacturer: (name, address) ____Chevron Chemical Co. Location of Research: (name, address of exptl. location) ____ Hans Nelson's Nursery, Boring, OR 3 trees per plot, completely randomized design, 4 Replications Plot Size and Experimental Design: ___ Plant Spacing: ____ Row Spacing: _____ ___ Dates of Application(s): ___ May 18, 1977 1 No. of Pesticide Applications Interval(s) Last Application to Sampling __ Sampling Method: _____ Observe leaves for larval mines Type of Application: (foliar, soil incorp., etc.) _____Foliar Method of Application: _____ Ground, hydraulic powered sprayer with handgun Application Equipment: (type, volume, pressure, etc.) _____hydraulic powered handgun at 50 psi Other Pesticides Applied: (spray tank additives, stickers, etc.) _______none____ Cultural Practices: (fertilization, cultivation, etc.) unknown Soil type: _____ pH: _____ Organic matter: ____ overhead sprinkler irrigation Rainfall and Irrigation:

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APPENDIX 1

Richard G. Clarke, Department of Entomology, Oregon St. Univ.

Investigator (Name and Address)

Corvallis, OR 97331

1900A PR Number

Summary of results (narrative):

No leafminner population developed so no damage was noted in the treated or untreated trees. No phytotoxicity was observed on the trees.

Note: Use back of this form or attach additional pages if needed.

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1900 A PR Number

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PERFORMA	REP 2
	REP 1
RATE	a.i.
-	TREATMENTS

See Summary of results (narrative)

APPENDIX 1

'Indicate Units	² Performance Data (define measurement of pest population):	³ Phytotoxicity Data (define measurement, or Index of injury):

June 22, 1977

Date(s) (Performance, Phytotoxicity and Yields) data were taken: Performance

NONE was Noted

Phytotoxicity _

Yield

IR-4—NATIONAL PESTICIDE REGISTRATION PROGRAM

APPENDIX 2

MINOR USE EFFICACY REPORT FORM-1

PR NO: 1865A

Date of Report: Dec 12, 1978 Year Research Conducted: 1977 (For performance and phytotoxicity data) Control of Adult root weevils Project Title: _ Investigator (name, address, phone): Richard G. Clarke, Department of Entomology, Oregon State University, Corvallis, OR 97331 (503) 754-4392 Commodity/Site: Rhododendron Root Weevils, Otiorhynchus spp, Obscure Root Weevil (Sciopithes obscurus) _ Rates (a.i.): 0.5, 1.0 and 2.0 lb ai/100 gai Location of Research: (name, address of exptl. location) _____ Thompson Nursery, Waldport, Oregon Single plant plots, completely randomized design (4 reps Plot Size and Experimental Design: Plant Spacing: Row Spacing: _____ _ Dates of Application(s): 30 june, 28 July, 25 Aug 1977 No. of Pesticide Applications ____ 1 month Interval(s) Last Application to Sampling ___ Count the number of feeding scars on leaf margins(notches) on random leaves Sampling Method: ____ Type of Application: (foliar, soil incorp., etc.) Foliar Method of Application: Ground, hydraulic powered sprayer with handgun Application Equipment: (type, volume, pressure, etc.) hydraulic powered handgun at 50 psi none Other Pesticides Applied: (spray tank additives, stickers, etc.) Cultural Practices: (fertilization, cultivation, etc.) unknown Soil type: pH: _____ Organic matter: ___ overhead sprinkler irrigation Rainfall and Irrigation:

Summary of results: Use reverse side

APPENDIX 2

Richard G. Clarke
Department of Entomology, OSU, Corvallis, OR

Investigator (Name and Address)

1865A PR Number

Summary of results (narrative):

The weevil population was very low at this location resulting in great variation between plots within treatments. This probably accounts for the lack of significance between treatments.

Note: Use back of this form or attach additional pages if needed.

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Uregon State University, Corvallis, OR Investigator (Name and Address)

EXPERIMENTAL TABULAR DATA

1865A PR Number

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REP 1 REP 2 REP 3 REP 4 X	1.00ª	0.502	1,00a	3.75a
RATE¹	2.0 lb	1.0 lb	0.5 1b	1 1 1
TREATMENTS	Imidan	Imidan	Imidan	Untreated

ameans followed by same letter were not significantly different at the 5% level

One leaf whorl on each of the 3 treated plants in each replication (plot) The total number of notches per plot was recorded. NO PHYTOTOXICITY WAS NOTED. on leaf margins. was observed for feeding notches (Scars) ²Performance Data (define measurement of pest population): 3Phytotoxicity Data (define measurement, or index of injury): **'Indicate Units**

Sept 28, 1977 Date(s) (Performance, Phytotoxicity and Yields) data were taken; Performance Yield After each application **Phytotoxicity**

Richard G. Clarke Department of Entomology Oregon St. U. Corvallis, OR 97331

1865A

Investigator (Name and Address)

APPENDIX 3

PR Number

Summary of results (narrative):

A very low root weevil adult population developed on the plants with all feeding damage very low with little difference between treated and untreated plants.

Note: Use back of this form or attach additional pages if needed.

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EXPERIMENTAL TABULAR DATA

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	REP 4	9.0	2.0 1.0 0.9 ±	1.2 1.2 0.95	1.6 1.4 1.30
PERFORMANCE ²	REP 2 REP 3 REP 4 X	0.8	2.0	1.2	1.6
PERFC	REP 2	1.8 0.4 0.8 0.6 0.9 ±	0.0 9.0	0.4 1.0	1.2 1.0
	REP 1	1.8	9.0	7.0	7.5
BATE!	a.i.	2.0	1.0	0.5	1
	TREATMENTS	Imidan	Imidan	Imidan	Untreated

APPENDIX 3

5 leaf whorls were rated for damage from each plant (replication). ²Performance Data (define measurement of pest population): **'Indicate Units**

Rating scale of 04 was used where 0= no feeding injury, 1= some feeding (acceptable) 2 or greater = unacceptable.

ANY PLANTS

NO NO

NO PHYTOTOCITY WAS NOTED

³Phytotoxicity Data (define measurement, or Index of injury):

Date(s) (Performance, Phytotoxicity and Yields) data were taken: Performance

After each application.

Phytotoxicity _

October 4, 1977

IR-4—NATIONAL PESTICIDE REGISTRATION PROGRAM

APPENDIX 4

MINOR USE EFFICACY REPORT FORM—1

PR NO:

6675A

Date of Report: Oct 10, 1978

1978

or performance and phytotoxicity data)	Year Research Conducted. 1970
	h Moth, Synanthedon sequoiae (Hy. Edwards)
richter (name address phone). Rich	ard G. Clarke, Department of Entomology, Oregon State vallis, OR 97331 (503) 754-4392
Commodity/Site:Pinus	
Pest(s):Sequipia Pitch Moth, Syna	anthedon sequoiae (Hy. Edwards)
Formulation4E	EPA Reg. No Rates (a.i.): _0.5, 1.0 and 2.0 lb/100 gal. Dow Chemical Company SunRiver Estates, SunRiver, OREGON
Plot Size and Experimental Design.	Trees (plots) Completely Randomized Design Plant Spacing: Dates of Application(s): June 30,1978
Type of Application: (foliar, soil incorp., etc.) Method of Application: Ground, hydra: Application Equipment: (type, volume, pressure,	Tree Trunk ulic sprayer with handgun etc.)hydraulic powered handgun at 50 psi
	stickers, etc.)none .
Soil type:unknown	
	tter: <u>unknown</u>
Rainfall and Irrigation:no	irrigation
Summary of results: Use reverse side	

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Richard G. Clarke, Department of Entomology

Oregon State University, Corvallis, OR 97331

Investigator (Name and Address)

APPENDIX 4

6675A PR Number

Summary of results (narrative):

The insect population was low and not uniform. There was a difference in the treated verses the untreated trees as far as the number of "new" pitch masses counted. But one is suspicious of the reliability of the counts because there was a higher number of new masses on the trees with the 2.0 lb rate as compared to the 0.5 lb rate. Again, as was determined in the Medford, Oregon plot, the Chlorpyrifos does seem to be providing control and we are encouraged to put out trials again next year with 2 applications.

Note: Use back of this form or attach additional pages if needed.

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	REP 2				
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BATE!	a	0.5 lb/ 100 Gal.	1.0 lb/ 100 gal.	2.0 lb/ 100 gal	
	TREATMENTS	Chlorpyrifos 0.5 lb/ 100 Gal.			Untreated

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Number of "New" bitch	
Indicate Units	Performance Data (define measurement of pest population):

No phytotoxicity 2 cm (Dime-size) ³Phytotoxicity Data (define measurement, or Index of injury):

Date(s) (Performance, Phytotoxicity and Yields) data were taken: Performance

Phytotoxicity

Yield.

1978

Aug 24,

IR-4—NATIONAL PESTICIDE REGISTRATION PROGRAM

APPENDIX 5

PR NO:

1866A Date of Report: Oct 10, 1978 MINOR USE EFFICACY REPORT FORM-1

minton data arrivation	Dailo 07.1.0p. 1 - 7, 7, 1
For performance and phytotoxicity data)	Year Research Conducted: 1978
Project Title:Control of Sequoia Pitch Moth, Syn	
Investigator (name, address, phone): Richard G. Clarke, University, Corvallis, OR 97331	Department of Entomology, Oregon State (503) 754-4392
Commodity/Site:Pinus	
Pest(s): Sequoia Pitch Moth, Synanthedon sequoia	
Pesticide: Phosmet/Imidan Formulation	al Company Roque Valley Country Club
Plot Size and Experimental Design: Row Spacing: Pla No. of Pesticide Applications Single Trees (plot Pla Da	nt Spacing: tes of Application(s):July 6, 19780
Interval(s) Last Application to Sampling 6 week Sampling Method: Count the number of new pito Type of Application: (foliar, soil incorp., etc.) Tree Method of Application: Ground, hydraulic sprayer was application Equipment: (type, volume, pressure, etc.) Hydraulic sprayer was application of the control of the contr	trunk
Other Pesticides Applied: (spray tank additives, stickers, etc.)	
Cultural Practices: (fertilization, cultivation, etc.)	
Soil type:unknownOrganic matter:unknown	
) as lawn irrigated
Rainfall and Irrigation:	

Summary of results: Use reverse side

Richard G. Clarke, Department of Entomology Oregon State University, Corvallis, OR 97331

Investigator (Name and Address)

1866A PR Number

APPENDIX 5

Summary of results (narrative):

No clear trend was evident in the data. The Phosmet seems to be less effective compared to the results received from the Chlorpyrifos at the same location (see 6675 A - 1978 data). It is not known at this time if we should include this chemical in 1979 testing since it would appear to be less effective. See 6675A (1978 data) for additional comments.

Note: Use back of this form or attach additional pages if needed.

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EXPERIMENTAL TABULAR DATA

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RATE:	a.i.	0.5 lb/ 100 gallons	1.0 lb/ 100 gal.	2.0 lb/ 100 gal.)	
	TREATMENTS	Phosmet			Untreated	

Number of "new" pitch masses on treated tree trunks - less than 2 cm in diameter (about dime-size) ²Performance Data (define measurement of pest population): *Indicate Units

No noticeable phytotoxicity ³Phytotoxicity Data (define measurement, or Index of injury):

Date(s) (Performance, Phytotoxicity and Yields) data were taken: Performance

Phytotoxicity

Aug 17, 1978

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IR-4—NATIONAL PESTICIDE REGISTRATION PROGRAM

APPENDIX 6
MINOR USE EFFICACY REPORT FORM—1

PR NO: 6675 A

Date of Report: Oct 10, 1978

For performance and phytotoxicity data)	Year Research Conducted: 1978
Project Title: Control of Sequoia Pitch Moth, Synanth	
Investigator (name, address, phone): Richard G. Clarke, I Corvallis, OR 9733:	Department of Entomology, Oregon State
Commodity/Site: Pinus	
Pest(s): Sequoia Pitch Moth, Synanthedon sequo	iae (Hy. Edwards)
Pesticide:Chloryprifos 4E FormulationDow_Chemi	EPA Reg. No Rates (a.i.):
	d, OREGON
Plot Size and Experimental Design: Row Spacing: Plant No. of Pesticide Applications Date	t Spacing:
Interval(s) Last Application to Sampling 6 Weeks Sampling Method: Count the number of new I Type of Application: (foliar, soil incorp., etc.) Tree	oitch masses on earch tree trunk ee trunk ver with handgun
Application Equipment: (type, volume, pressure, etc.)	
Other Pesticides Applied: (spray tank additives, stickers, etc.)	
Cultural Practices: (fertilization, cultivation, etc.)	
Soil type:	
pH: Organic matter: un	known
Rainfall and Irrigation:Sprinkler (Ov	erhead)
Summary of results: Use reverse side	

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Investigator (Name and Address)

APPENDIX 6

Summary of results (narrative):

There was at the most a trend in the means which indicated that some control was provided by the 1 and 2X rates (1.0 and 2.0 lb ai/100 gal). Because of the long flight season (over 2 months) it may be that 2 applications will be necessary to show significant differences in treatments. The evaluation method used in 1978 was not totally satisfactory and others will be used next year.

Next year we propose to put on 2 applications of test materials at 4 week intervals starting in June to see if these materials will indeed provide adequate control.

Note: Use back of this form or attach additional pages if needed.

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PERFO	REP 2	70	10	2	0				ement of	2	ement, or	
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RATE:	a.i.	0.5	1.0	2.0					its o Data (defi		y Data (defin	
	TREATMENTS	Chlorpyrifos			Untreated			,	*Indicate Units		³ Phytotoxicity Data (define measurement, or Index of injury):	

Aug 17, 1978

Date(s) (Performance, Phytotoxicity and Yields) data were taken: Performance

Phytotoxicity

Yield

IR-4—NATIONAL PESTICIDE REGISTRATION PROGRAM

APPENDIX 7

MINOR USE EFFICACY REPORT FORM-1

Summary of results: Use reverse side

PR NO: 6675 A Date of Report: Dec 20, 1979

For performance and phytotoxicity data)	Year Research Conducted: 1979
	th, Synanthedon sequoiae (Hy. Edwards)
	rke, Department of Entomology; Oregon State
Commodity/Site:Pinus	
Pest(s):Sequoia Pitch Moth, Synanthedon	sequoiae (hy. Edwards)
Pesticide:Chloryprifos	EPA Reg. No
Formulation 4E	Hales (a.i.).
DOW C	TICH TOWN
Manufacturer: (name, address)Location of Research: (name, address of exptl. location)	Rogue Valley Country Club
- di	e tree plots, Randomized Complete block
Row Spacing:	Plant Spacing:
No of Pesticide Applications2	Plant Spacing: June 26, July 24, 1979 Dates of Application(s): June 26, July 24, 1979
	It are older
Interval(s) Last Application to Sampling Count the number of last sampling Method:	muse in mitch masses on each tree trunk
Sampling Method:Count the number of la	tree trunk
Total Application: (foliar soil incorp., etc.)	and a demanded
Method of Application:Ground, hydraull	c sprayer with handgun Hydraulic powered handgun at 400 psi .
Application Equipment: (type, volume, pressure, etc.)	
	none
Other Pesticides Applied: (spray tank additives, stickers,	etc.)
Cultural Practices: (fertilization, cultivation, etc.)	own
unkno	own
Soil type:	unknown
unknown Organic matter:	
sprink	ler (Overhead)
Rainfall and Irrigation:	

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PR Number

Investigator (Name and Address)

APPENDIX 7

Summary of results (narrative):

Two applications at a 4 week interval of Chlorpyrifos provided pitch moth control during 1979. In table 1, the total larval counts and means are presented. These combined large (2nd yr) and small (current yr) larval counts. There was no difference in the control at the 3 rates tested. The 0.5 lb ai/100 gal rate was adequate. No phytotoxicity was evident at any tested rate. Although there was high variability between replications, on the average more live larvae were present on untreated trees.

In table 2, the number of small (new) larvae are presented. Here control is most evident. In 3 of the four replications, small larvae were collected in the untreated trees. More "new strikes" or fresh pitch flows of small diameter were also evident on the untreated trees. In 1977 and 1978 tests, control was not evident because of the apparent need of making 2 applications during the major adult moth flight period (June 15-August 15). Another factors is that we have been treated the same trees for 3 seasons and the combined effect of these annual treatments may be evident. In any event, the 0.5 ai rate will control this insect.

Note: Use back of this form or attach additional pages if needed.

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	REP 4				*
UALITY	REP 3				•
YIELDS/QUALITY	REP 2				
·	REP 1				
	! ×!				
5	REP 4				
PHYTOTOXICITY3	REP 3				
PHYTO	REP 2				
	REP 1				
	×	2.0	2.5	2.3	4.3
	REP 4	0	0		2
PERFORMANCE ²	REP 3	\sim	┯┥	ᆏ	9
PERFO	REP 2	ᠵᠬ	0	7	← 1
	REP 1	2	0	Υ	ω
RATEI	a.i.	0.5	1.0	2.0	ı
	TREATMENTS	Chlorpyrifos			Untreated

APPENDIX 7

All pitch masses on treated and untreated were dug out and the number ²Performance Data (define measurement of pest population); of live larvae were recorded 'Indicate Units

No phytotoxicity was evident at any rate ³Phytotoxicity Data (define measurement, or Index of injury):

Date(s) (Performance, Phytotoxicity and Yields) data were taken: Performance

Oct 25, 1979

Yield Phytotoxicity _

PR Number 6675 A

Investigator (Name and Address)

EXPERIMENTAL TABULAR DATA

Number of small (new)Larvae TABLE 2.

	REP 4			;	<i>i</i>
YIELDS/QUALITY	REP 3 REP 4				•
YIELDS/	REP 2				
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	l×I				,
T \	REP 4				
PHYTOTOXICITY3	REP 2 REP 3 REP 4 X				
PHYT	REP 2				
	REP 1				
	[×]	0.5	0.5	0.3	2.3
Ц3	REP 4	0	0	0	₩.
PERFORMANCE ²	REP 2 REP 3 REP 4	0	₩	0	4
PERFO	REP 2	₽	₩	0	0
	REP 1	← 1	0	₩	4
	a.i.	0.5	1.0	2.0	1
	TREATMENTS	Chlorpyrifos	,		Untreated*

|×|

* new "strikes" or pitch flows were evident on the untreated trees

APPENDIX 7

'Indicate Units

All pitch masses on treated and untreated trees were dug out and the number of small larvae were recorded ²Performance Data (define measurement of pest population):

3Phytotoxicity Data (define measurement, or Index of injury):

Oct 25, 1979

no phytotoxicity was evident at any rate

Date(s) (Performance, Phytotoxicity and Yields) data were taken: Performance

Yield

Phytotoxicity

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